

# The Decline and Fall of Joint Acquisition Programs

William E. Novak  
Andrew P. Moore  
Julie B. Cohen  
Jay D. Marchetti  
Matthew L. Collins

2014 AFCEA Acquisition  
Research Symposium

15 May 2014



Software Engineering Institute

Carnegie Mellon

© 2014 Carnegie Mellon University

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>15 MAY 2014</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2014 to 00-00-2014</b>	
4. TITLE AND SUBTITLE <b>The Decline and Fall of Joint Acquisition Programs</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Carnegie Mellon University, Software Engineering Institute, Pittsburgh, PA, 15213</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>AFCEA 11th Annual Acquisition Research Symposium, 14-15 May 2014, Monterey, CA.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>12</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

Copyright 2014 Carnegie Mellon University

This material is based upon work funded and supported by the Department of Defense under Contract No. FA8721-05-C-0003 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the United States Department of Defense.

References herein to any specific commercial product, process, or service by trade name, trade mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by Carnegie Mellon University or its Software Engineering Institute.

NO WARRANTY. THIS CARNEGIE MELLON UNIVERSITY AND SOFTWARE ENGINEERING INSTITUTE MATERIAL IS FURNISHED ON AN “AS-IS” BASIS. CARNEGIE MELLON UNIVERSITY MAKES NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, AS TO ANY MATTER INCLUDING, BUT NOT LIMITED TO, WARRANTY OF FITNESS FOR PURPOSE OR MERCHANTABILITY, EXCLUSIVITY, OR RESULTS OBTAINED FROM USE OF THE MATERIAL. CARNEGIE MELLON UNIVERSITY DOES NOT MAKE ANY WARRANTY OF ANY KIND WITH RESPECT TO FREEDOM FROM PATENT, TRADEMARK, OR COPYRIGHT INFRINGEMENT.

This material has been approved for public release and unlimited distribution except as restricted below.

This material may be reproduced in its entirety, without modification, and freely distributed in written or electronic form without requesting formal permission. Permission is required for any other use. Requests for permission should be directed to the Software Engineering Institute at [permission@sei.cmu.edu](mailto:permission@sei.cmu.edu).



## The Decline and Fall of Joint Acquisition Programs

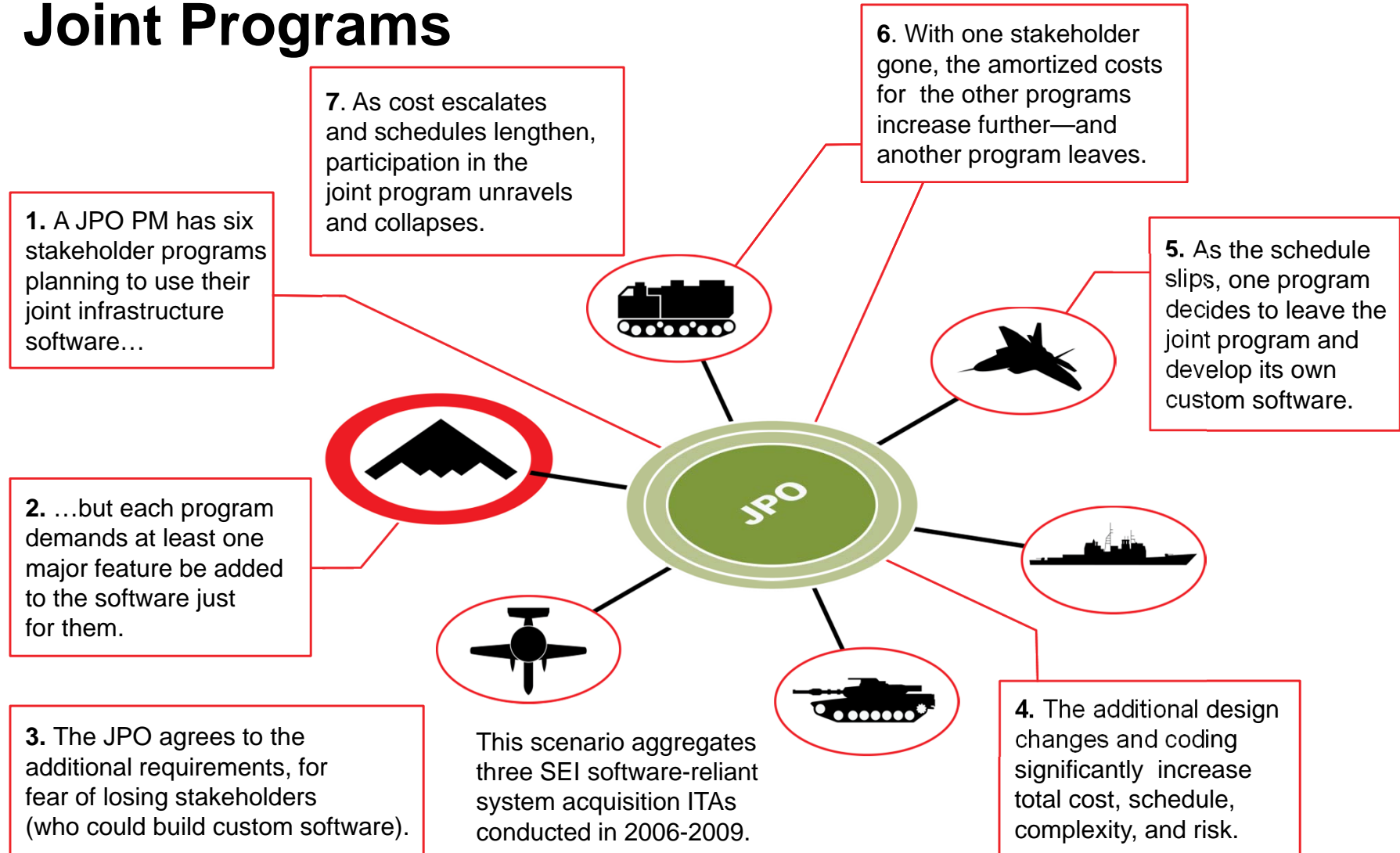
# Findings from Prior Joint Program Research

- “Joint programs, whether large or small, in development or production, and irrespective of age, are statistically more likely to encounter programmatic breaches than their single system counterparts.”  
— “*The Acquisition of Joint Programs: The Implications of Interdependencies*” by Brown, Flowe, Hamel
- “The resistance to bi-service programs is thus deep-seated and powerful... When asked to consolidate programs they will make powerful arguments in favor of the attributes of their own proposal and against the attributes of the other service’s proposal.”  
— “*Inter-Service Weapons Rivalry*” by Robert F. Coulam
- “The common problems that cause delays and cost overruns can typically be attributed to ‘mission creep’ requirements that surface during the SDD phase.”  
— “*Program Management Challenges in a Joint Service Environment*” by LtCol Dorothy E. Taneyhill
- “...Service parochialism... conspires to ensure that individual Service equities... dominate the acquisition process.”  
— “*Reforming the Joint Acquisition Process*” by Brinson, Jones, and Kelly
- “Pentagon decisionmaking reforms since World War II are largely a history of efforts to curtail the power of the Services to veto joint solutions that serve the entire military better.”  
— “*Reforming Pentagon Strategic Decisionmaking*” by Lamb, Lachow



# The Decline and Fall of Joint Acquisition Programs

## Joint Programs



## The Decline and Fall of Joint Acquisition Programs

# What are Social Dilemmas?

What if we all could be better off, but no one has an incentive to change?

Dilemmas are all about cooperation—and there are two basic types:

### Social Trap: “*The Tragedy of the Commons*”

- Someone wants a benefit that will cost everyone else
- Some are tempted by that benefit, but if *all* do, everyone is worse off.

### Social Fence: “*Producing a Public Good*”

- Someone faces a near-term cost that would benefit everyone else
- Some try to avoid the cost, but if *all* do, everyone is worse off.

### Social Trap Examples:

*Overfishing*: Everyone catching more fish will mean there are no more fish

*Congestion*: Everyone using a car for their convenience creates traffic jams

*Pollution*: It's cheaper to pollute, but everyone else pays the price in smog

***“Individually optimal decisions lead to collectively inferior solutions”***

### Key Idea

The “Tragedy of the Commons” is a multi-player version of the “Prisoners’ Dilemma”



## **The Decline and Fall of Joint Acquisition Programs**

# **What Key Mechanisms Undermine Joint Programs?**

**Stakeholders of joint programs demand additional (custom) requirements later in the lifecycle**

- The more time that elapses between establishing the baseline requirements and introducing new requirements, the more effort it takes to develop the software for those requirements.

**Underbidding is used to win development contracts**

- Underbidding leads to schedule pressure that can shortcut quality processes and increase firefighting and staff burnout.

**Developers are motivated to show good progress early in development**

- Failing to address the hardest requirements early in the development lifecycle (such as in the first increment) in order to show better progress, leads to greater rework to address them later in the lifecycle, slowing progress.

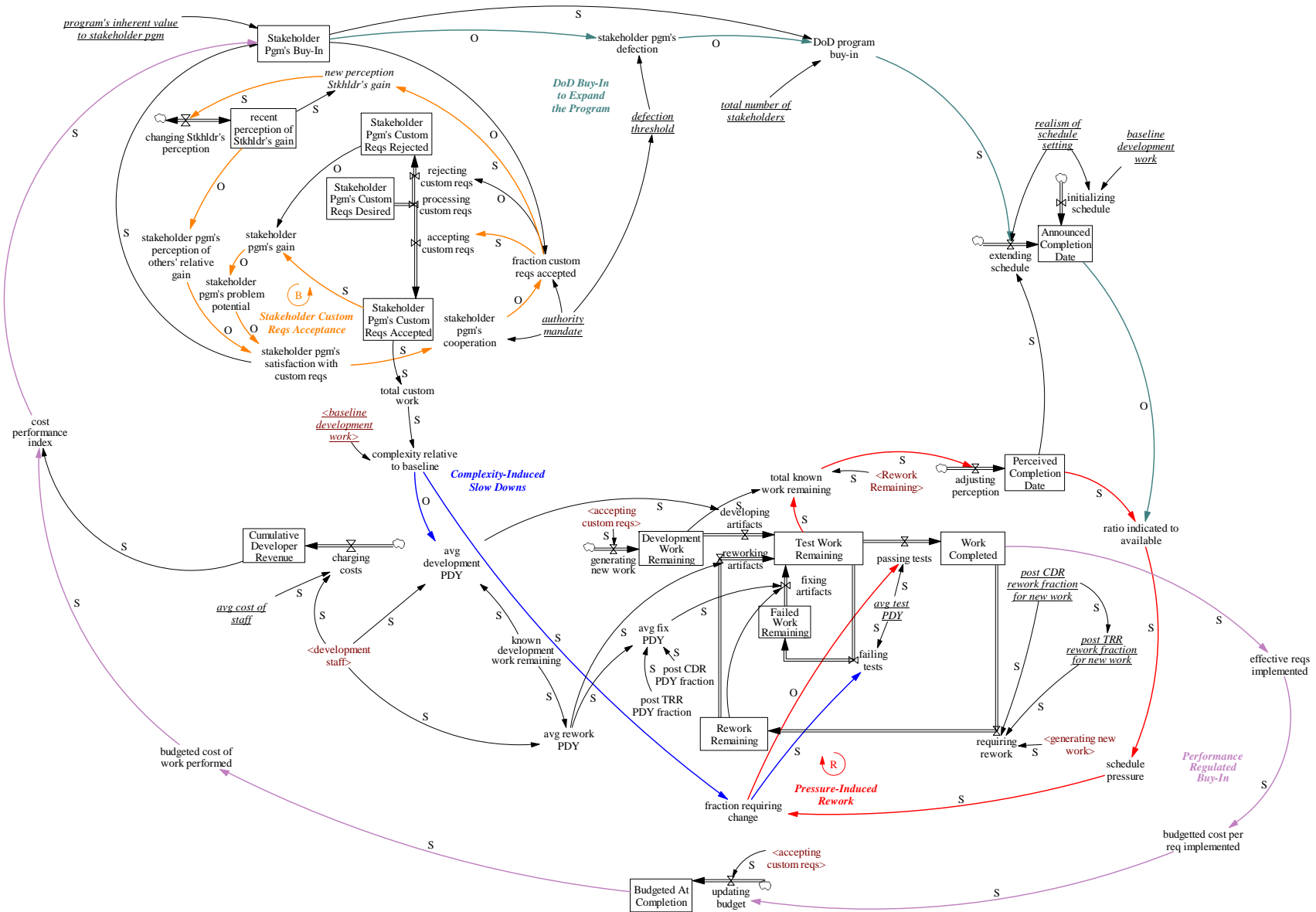
### **Take-away**

Understanding the underlying mechanism that drives joint program collapse is essential to fixing it



# The Decline and Fall of Joint Acquisition Programs

## System Dynamics Simulation Model Overview





# The Decline and Fall of Joint Acquisition Programs

## Grounding and Validating the Model

### Model Validation Approaches:

- 1) Historical Joint Program Performance Data
  - Data tracking the monthly progress was obtained from the PMO and contractor, and correlated with a timeline of other events/actions/decisions
- 2) Joint Acquisition Program Workshops
  - Conducted two 2-day workshops, each held with senior experts from a single joint program
  - Human subject research protocol ensured confidentiality of the data collected
- 3) Game-based Joint Program Experiment
  - Some “less attractive” behaviors of joint program stakeholders aren’t willingly revealed
  - Developing web-based game engine to host controlled experiments with experienced acquisition staff, to collect data on realistic behaviors in joint acquisition scenarios

### Collected Quantitative and Qualitative Data Corrects and Refines the Initial Model

- Refine joint program model structure based on the empirical stakeholder behaviors
- Use collected performance data to drive selected joint program model inputs
- Compare model simulation performance to historical program performance

#### Take-away

It's not enough to have only a notional or qualitative understanding of joint program dynamic behaviors.



# The Decline and Fall of Joint Acquisition Programs

## Key Research Findings

A key tipping point is crossed due to unrealistic schedules/late requirements

- Developer productivity as a function of schedule realism & late-addition req'ts
- Program managers need to know if they're about to “fall off a cliff” at a tipping point

Stakeholders played “Schedule Chicken”

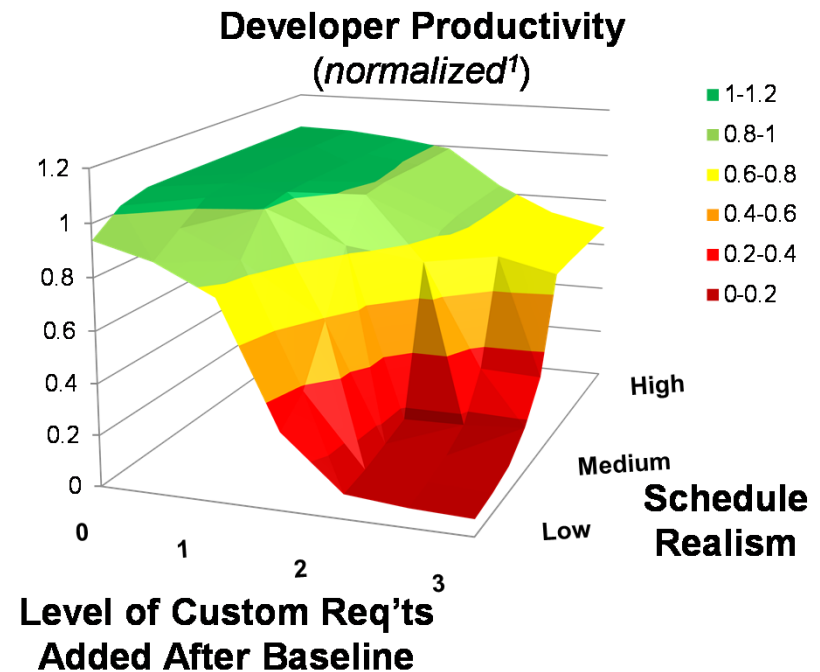
- Stakeholder platforms hid their own performance problems behind the joint program's schedule issues

There is an inherent “social trap” at the heart of a joint program

- The JPO accepting more late custom requirements to keep stakeholder programs engaged (to prevent defection/collapse) is a “no win” social trap that leads to program collapse, especially when an unrealistic schedule exacerbates the expanded scope.

Mandated joint program participation can have severe unintended consequences

- If a stakeholder program is unwillingly forced to join a joint program, they will find a way to leave—and their defection will likely lead to a cascade of defections that will collapse the joint program



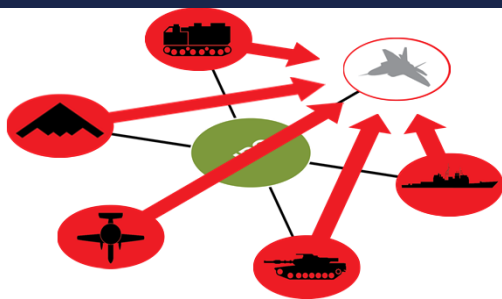
# The Decline and Fall of Joint Acquisition Programs

## Candidate Social Dilemma Solutions

**Goal:** Decrease custom requirements demanded by stakeholder programs

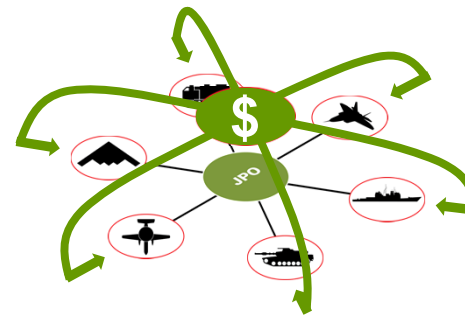
**Goal:** Increase realism of development schedule

### Altruistic Punishment



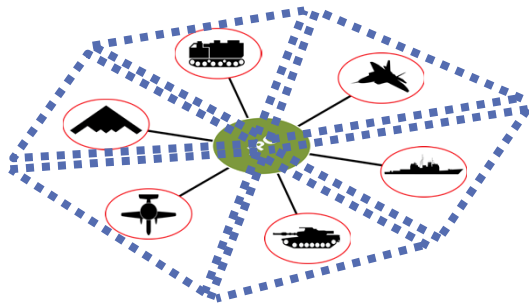
- PRO: Pay to penalize uncooperative partners
- CON: May escalate and cause retaliation

### Shared Destiny



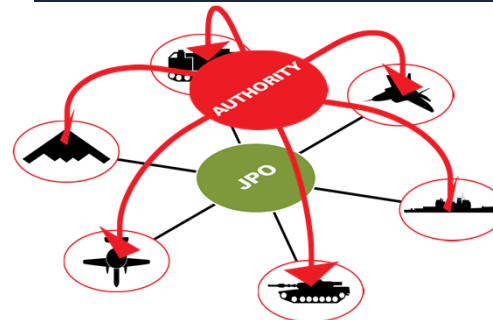
- PRO: Incentivize based on program outcome
- CON: Incentive may be far in the future

### Privatization



- PRO: Gives incentive to care for what's yours
- CON: Loses reason for cooperation

### Authority



- PRO: Regulates the good, prevents overuse
- CON: Unpopular to enforce a mandate



# The Decline and Fall of Joint Acquisition Programs

## Conclusions

### Current Status

- Preliminary observations show a tipping point toward much lower overall development productivity contributing to the joint program social dilemma

### Potential Areas of Future Research

- Model possible solution approaches and analyze their effectiveness
  - Identify the most promising solution(s) to be piloted on real programs
- Forecast acquisition program performance
  - Use a parameterized model as a management decision support tool
  - Run “what if?” scenarios on acquisition programs in progress & compare outcomes
  - Generate 3-D maps of the decision space to help decision-makers navigate it
- Influence future policy for joint acquisition programs
  - Help shape how joint acquisition programs are conducted through policy changes via the Service Component Acquisition Executives (CAEs) and DoD
- Create an acquisition *Management Flight Simulator*
  - Educate program staff as to pitfalls awaiting them, as well as potential mitigations





**Software Engineering Institute**

**Carnegie Mellon**



**Software Engineering Institute**

**Carnegie Mellon**

2014 AFCEA  
Acquisition Research Symposium  
15 May 2014  
© 2014 Carnegie Mellon University